

Determining and Addressing
Prevailing Factor. Is this in
fact work related?

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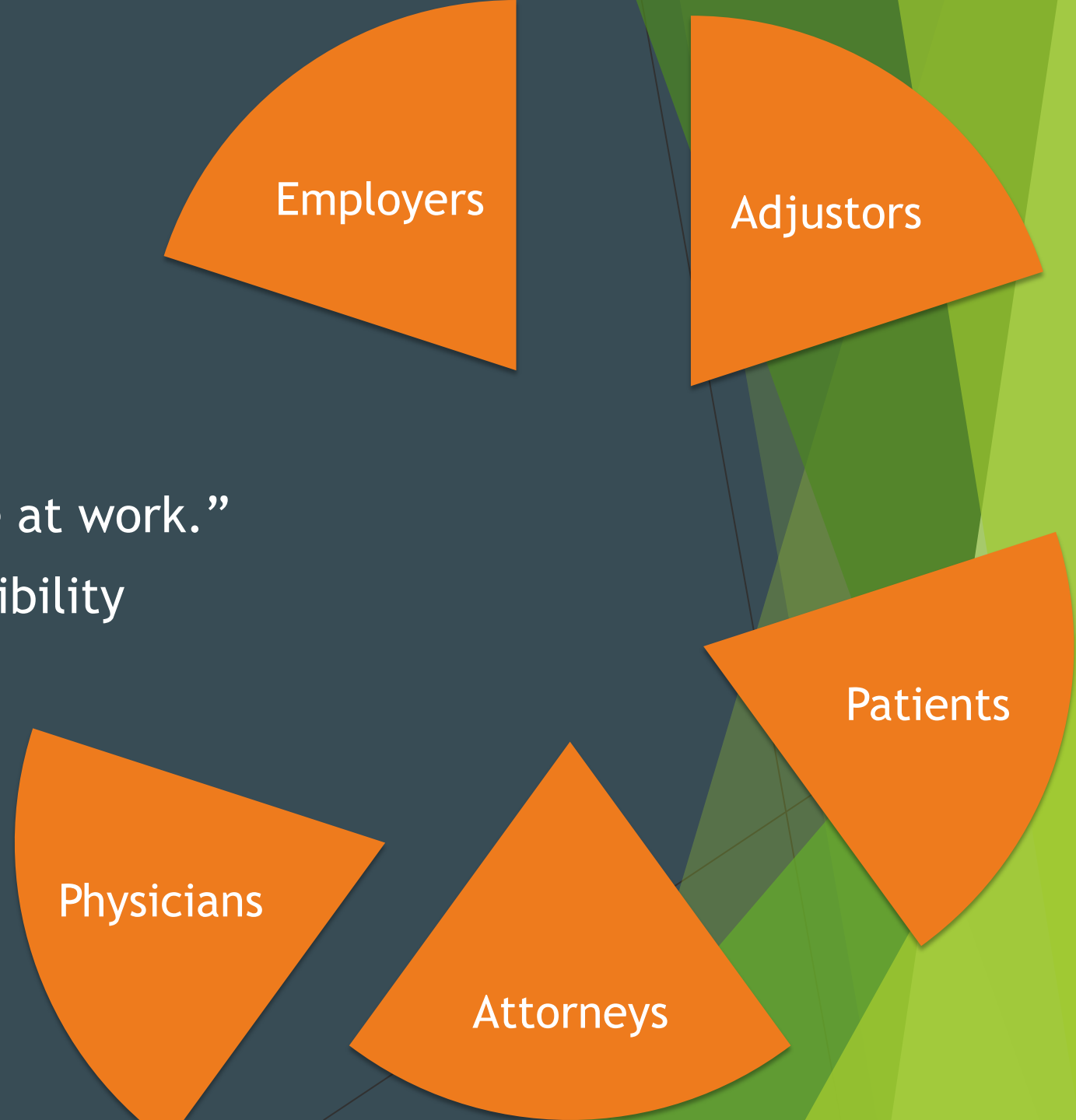
Prevailing Factor

- ▶ The primary factor, *in relation to any other factor*, causing both the resulting medical condition and disability




Quintilemma

- ▶ Employers Details of job
- ▶ Adjustors ... Medical records
- ▶ Patients “I hurt myself while at work.”
- ▶ Attorneys Law Responsibility
- ▶ Physicians Science





We have no idea
what you're talking
about

$X + Z - Y = 3/22$
 $TOT = .5747/32$
 $ITT = .37 = N - 3$
 $T/MNT = \text{Michaelangelo}$
 $+/- 50 \infty \% = ?$ 
 $(194321)^* + TAN(98)$
 $= 59.32745\%$ Effectiveness
There is a blue moon

	Y_1	Y_2
P	7	6
L	3	4
N	2	3
Y	5	1

$H_0 = \text{Blat}$
 $H_1 = \text{wh}$
Reject

Trust me,
it's science



Preface

- ▶ Most medical disorders are multi-factorial in origin
- ▶ Past traditional viewpoints have given greater weight to work activities rather than genetics.
- ▶ Degenerative disc disease - strongly associated with age and genetics and not cumulative trauma.
- ▶ Sometimes ... “What caused X?” ... Cannot be determined
- ▶ The Key: How the medical evidence is applied to a legal context

NIOSH and ACOEM guidelines for determining work relatedness

- ▶ 1. Identify evidence of disease
- ▶ 2. Review epidemiological evidence
- ▶ 3. Evaluate exposure (Work risk factors)
- ▶ 4. Consider other relevant factors (Individual risk factors)
- ▶ 5. Judge the validity of the testimony
- ▶ 6. Form conclusions about the work relatedness.

Causation Analysis

- ▶ Bradford-Hill Criteria
- ▶ Parallel factors
- ▶ Causality exam
- ▶ Occupational vs. Individual risk factors
- ▶ Cases

Causation Analysis

- ▶ *Bradford-Hill Criteria*
- ▶ Parallel factors
- ▶ Occupational vs. Individual risk factors
- ▶ Cases

Bradford-Hill Criteria

- ▶ Outlines the minimal conditions needed to establish a causal relationship between two occurrences.
- ▶ How to determine a causal link between a specific factor and a disease.
- ▶ Attempts to establish scientific validity
- ▶ Basis of evaluation used in all modern scientific research
- ▶ Causation involves multiple factors - individual and risk factors

Agent A
SMOKING



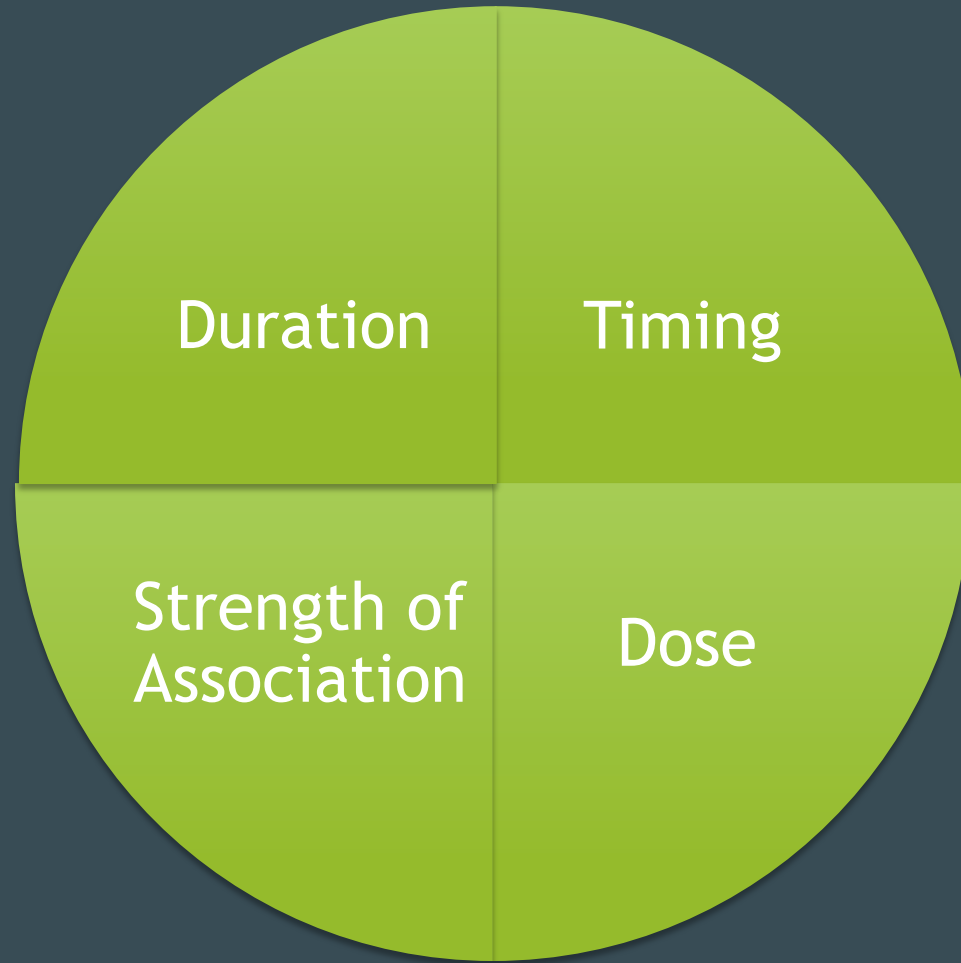
Agent B
LUNG CANCER

Agent A
REPETITIVE MOTION

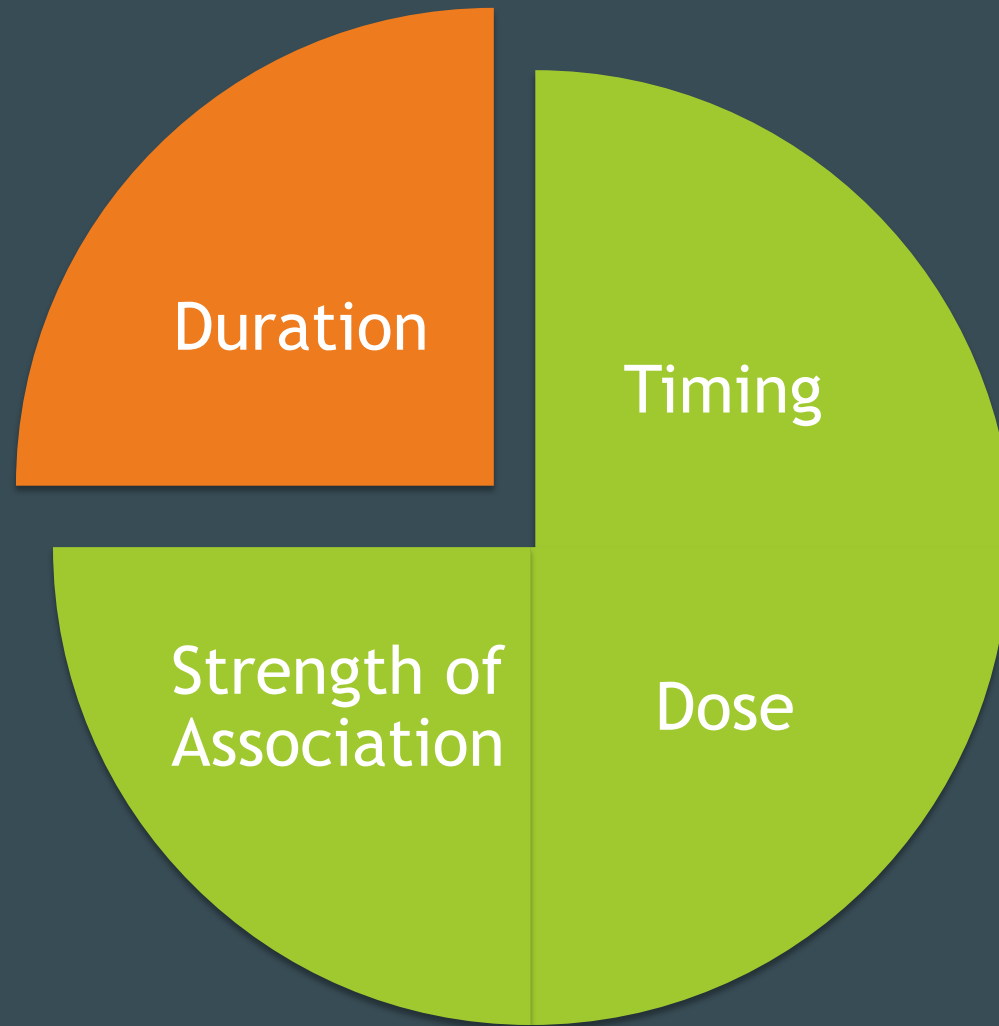


Agent B
CTS

Bradford-Hill Criteria



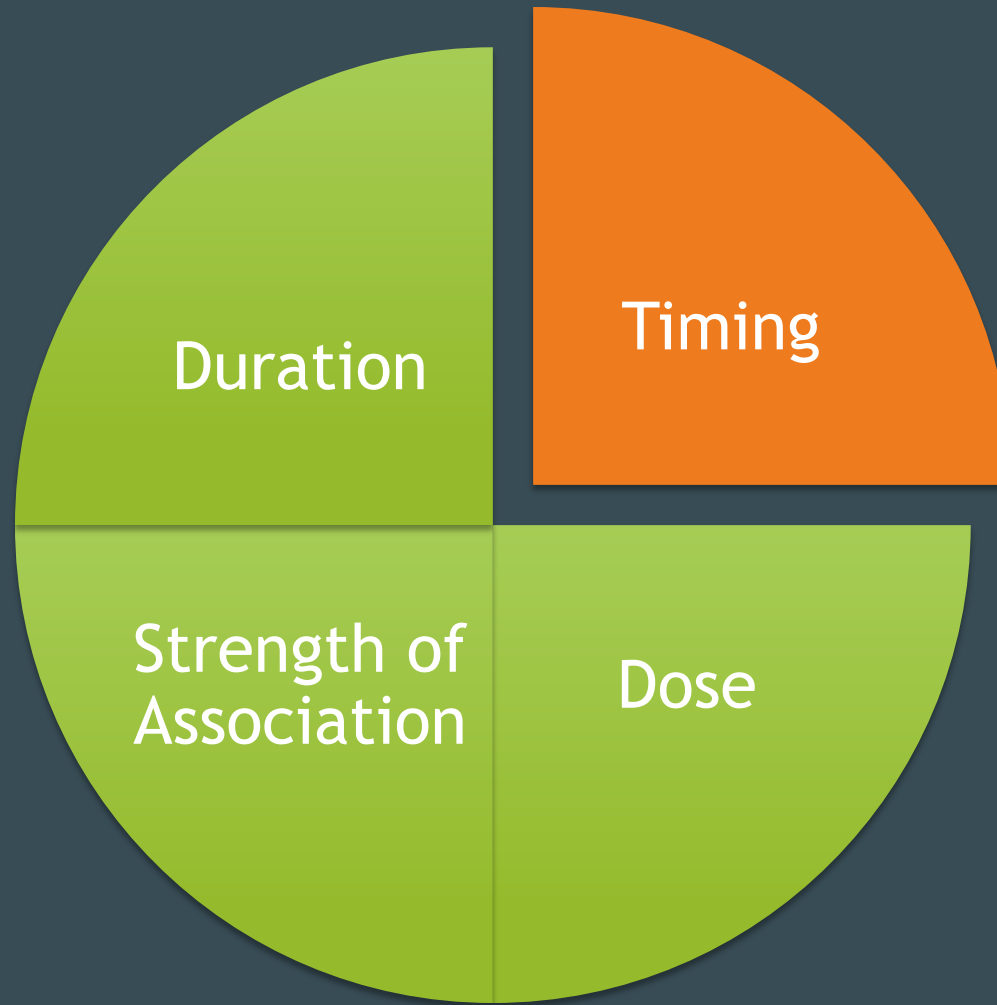
Bradford-Hill Criteria



Duration

- ▶ How long have the symptoms been present?
- ▶ Is there a history of pre-existing symptoms or injuries?
- ▶ Did the onset of symptoms follow the projected scientific models?

Bradford-Hill Criteria



Timing

- ▶ When did symptoms first appear?
- ▶ When was the injury reported?
- ▶ The quicker symptoms appear relative to the injury the more likely the two are related

Timing



- ▶ Fallacy to conclude that one event followed by a second necessarily demonstrates a causal relationship between the events.
i.e. Black cat crossing the street - you wreck
- ▶ Patients ... *“I hurt I hurt on the job..... therefore my job is responsible for my pain.”*

Angina Pectoris

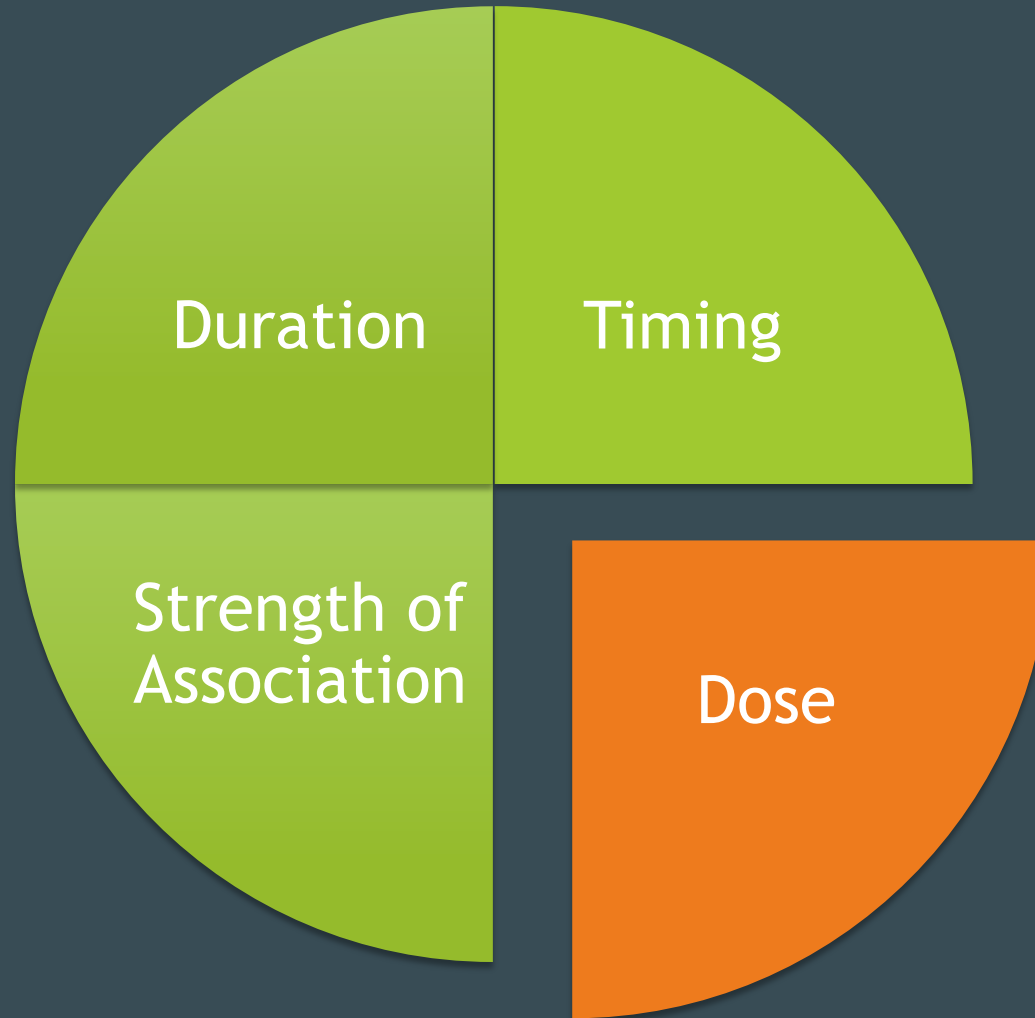


- ▶ Angina is caused by vascular occlusion to the heart
- ▶ We understand that exertional activities (i.e. climbing stairs) brings on symptoms, BUT is NOT the cause of the disease..... OR it would be called “Stair Climber’s Chest Pain.”

Timing

- ▶ Just because symptoms appear while performing a task does NOT mean the activity is the prevailing factor of the symptoms.

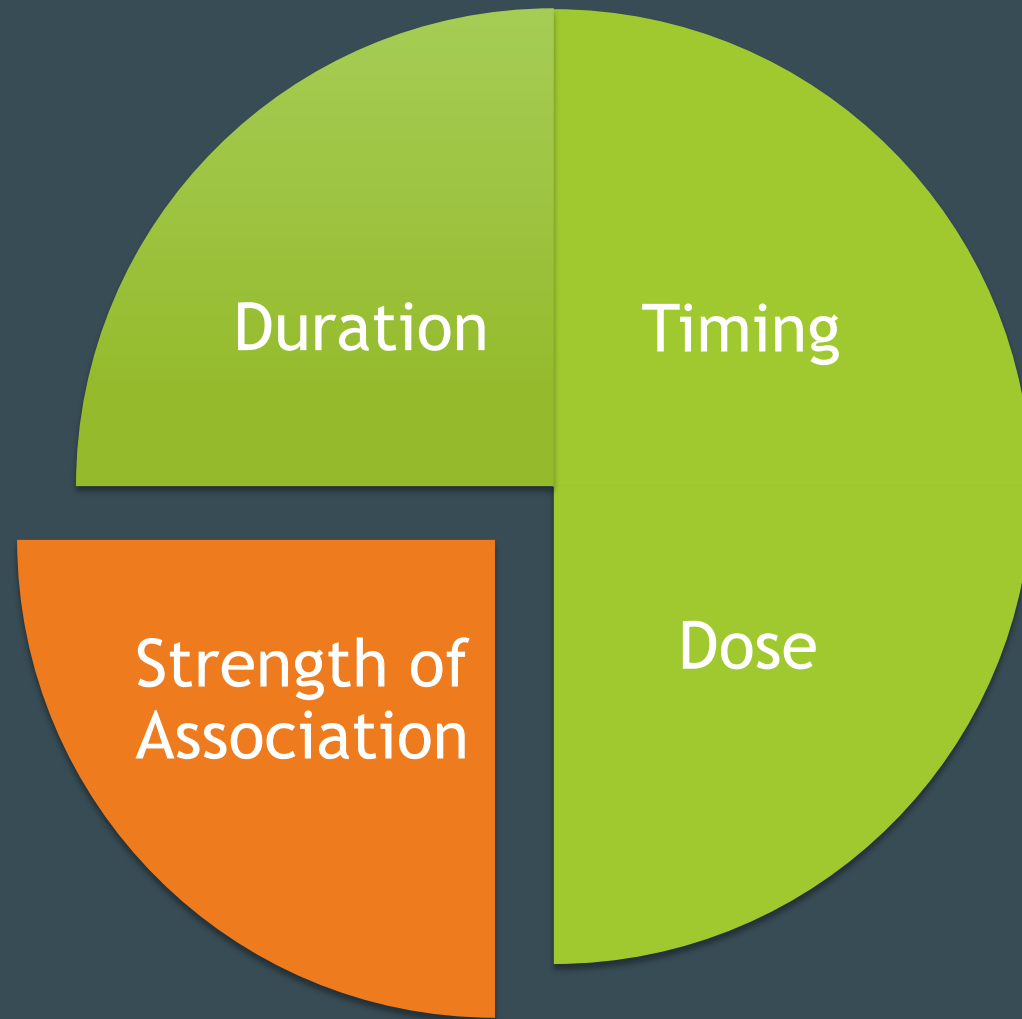
Bradford-Hill Criteria



Dose Response

- ▶ Was the extent of injury enough to cause the symptoms?
- ▶ Was there a previous tear or bulge?
- ▶ Was there previous surgery?
- ▶ Were there pre-existing symptoms?

Bradford-Hill Criteria



Strength of Association

- ▶ How bad was the injury?
- ▶ Was there swelling? Bruising? Fractures?
- ▶ Is the diagnosis plausible?

Strength of Association

- ▶ *Injury Expectations*
- ▶ Do symptoms improve during modified duty?
- ▶ Are symptoms better at the *start* of the work week and worse at the *end* of the work week?
- ▶ Do symptoms improve when patient is off work?
- ▶ Do symptoms improve with routine treatment?

Causation Analysis

- ▶ Bradford-Hill Criteria
- ▶ *Parallel factors*
- ▶ Occupational vs. Individual risk factors
- ▶ Cases



Normal



Degeneration



Work Injury



Normal Incidence of Low back pain

- ▶ #1 cause for missed work
- ▶ #2 reason for doctor visit
- ▶ 25-60% of all working Americans admit to having back pain symptoms each year.
- ▶ Lifetime prevalence of 80%
- ▶ Hoy, et al, The epidemiology of low back pain. *Best Pract Res Clin Rheumatol.* 2010;24(6): 769-781

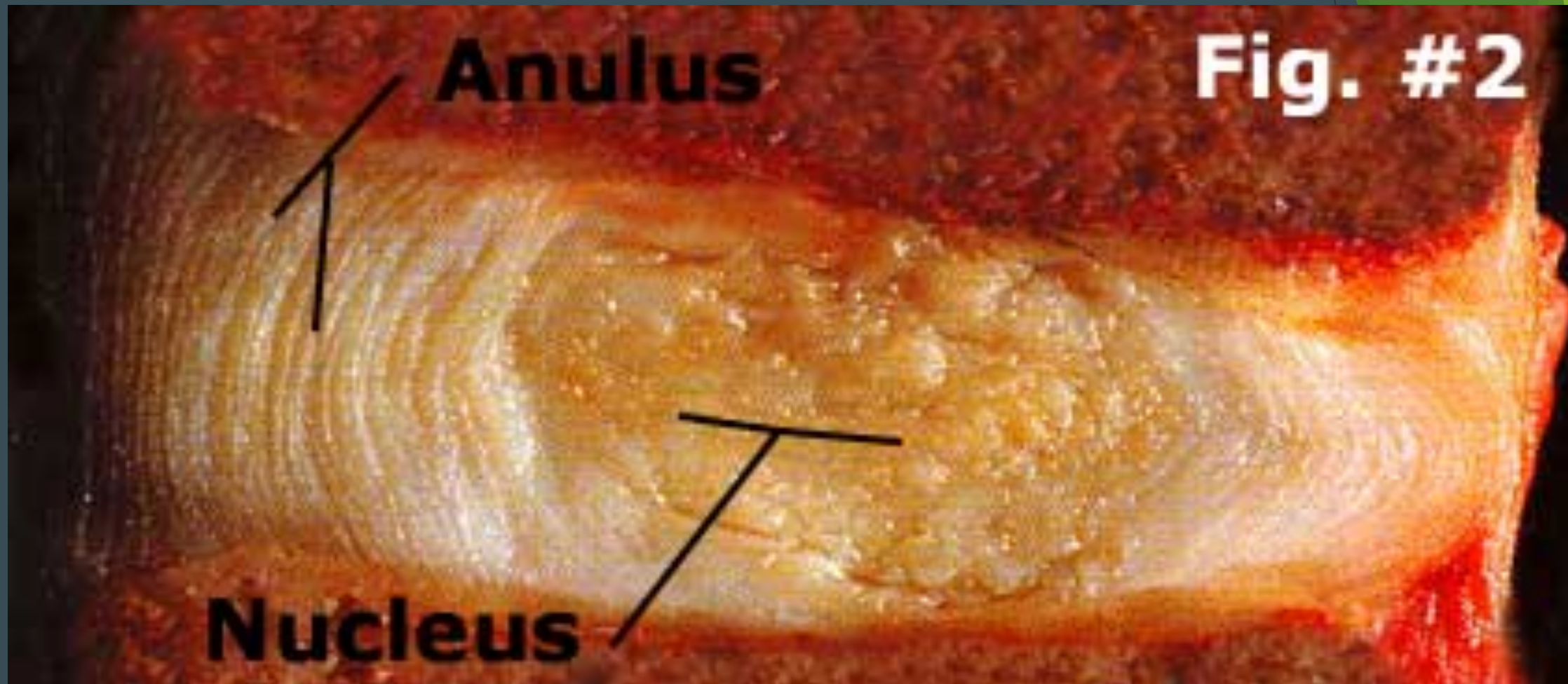
Degeneration

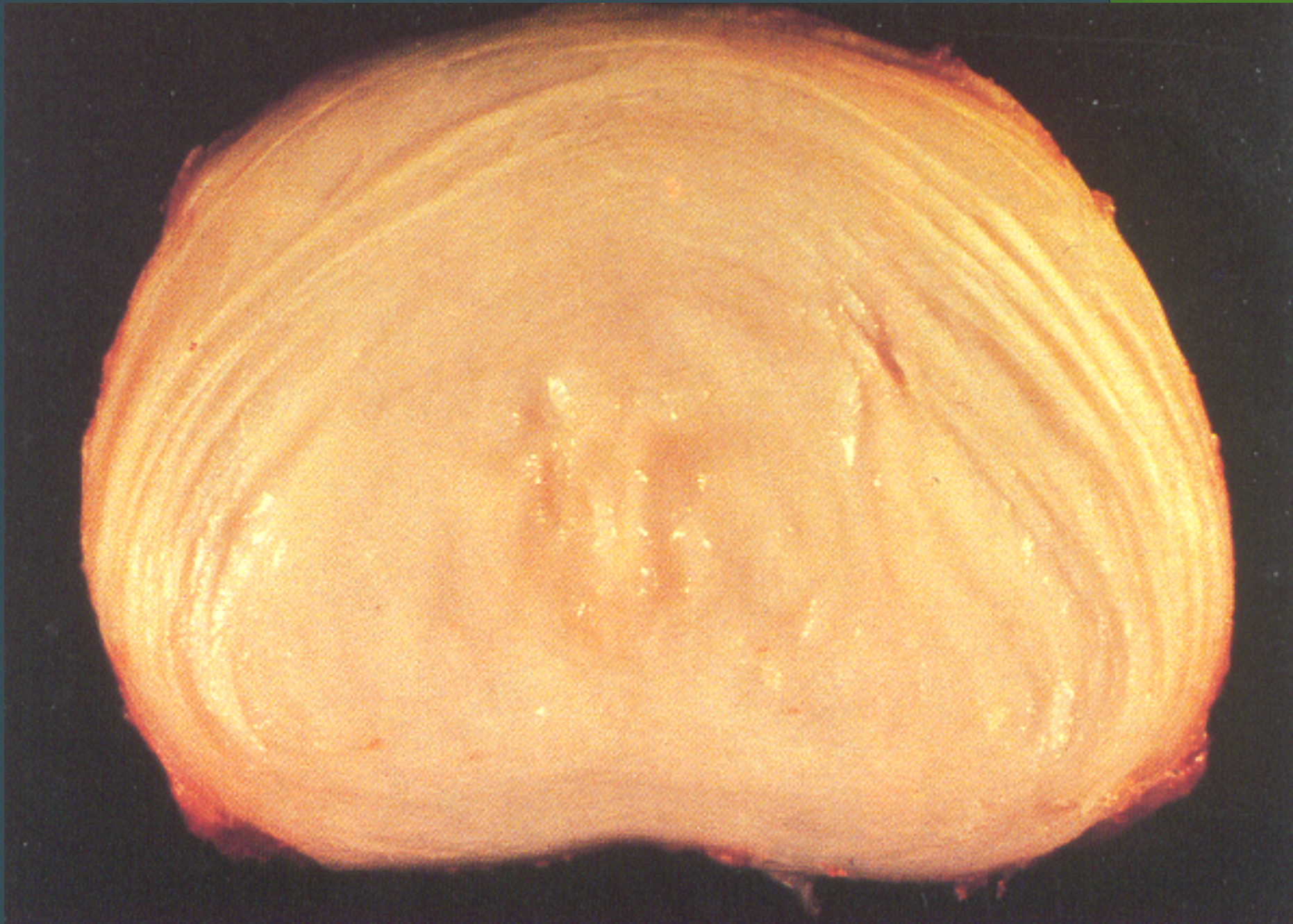
- ▶ Affects 20+ million adults in the U.S.
- ▶ Most prevalent chronic condition
- ▶ Most common cause of disability



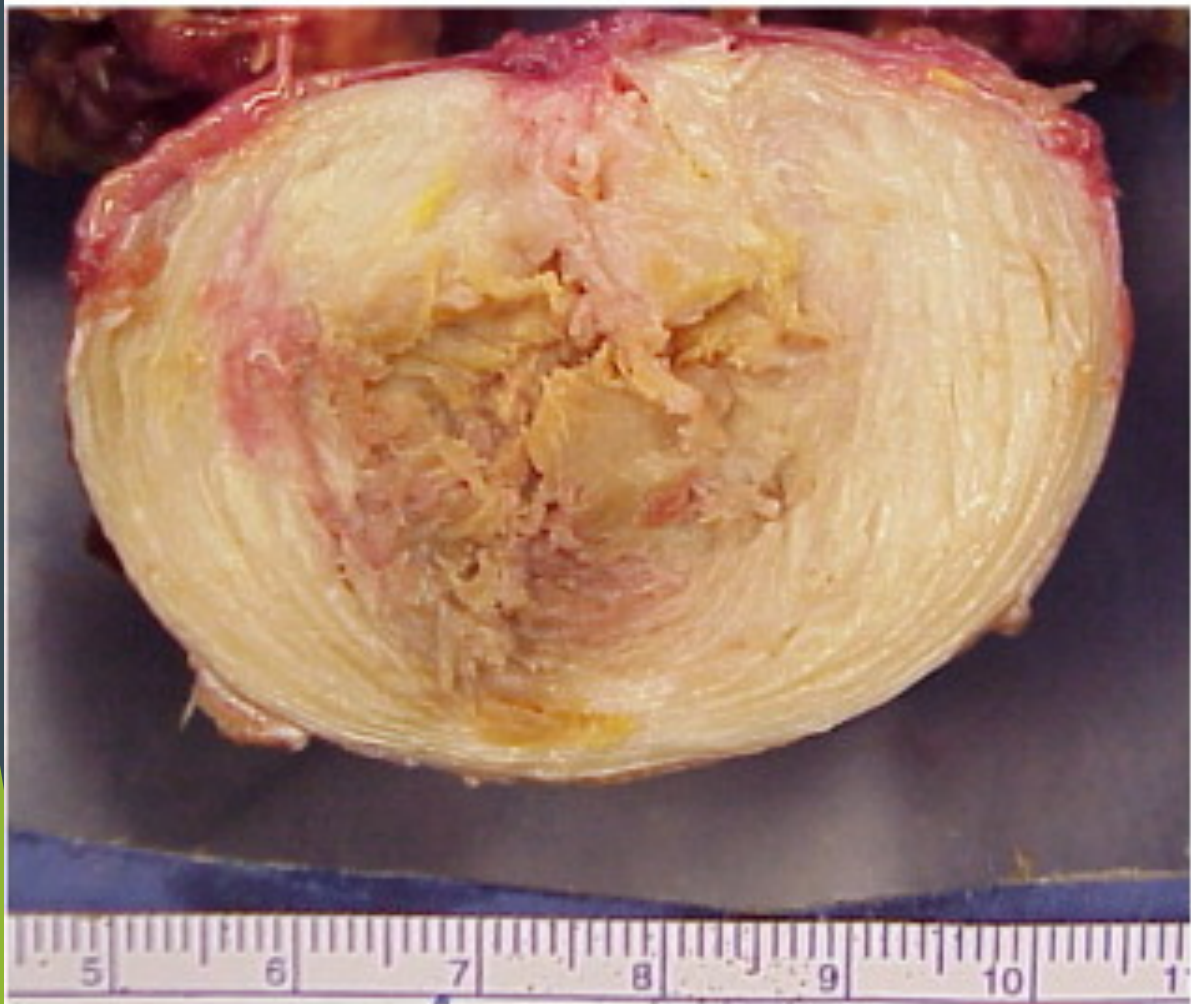
Lumbar Disc - Axial View



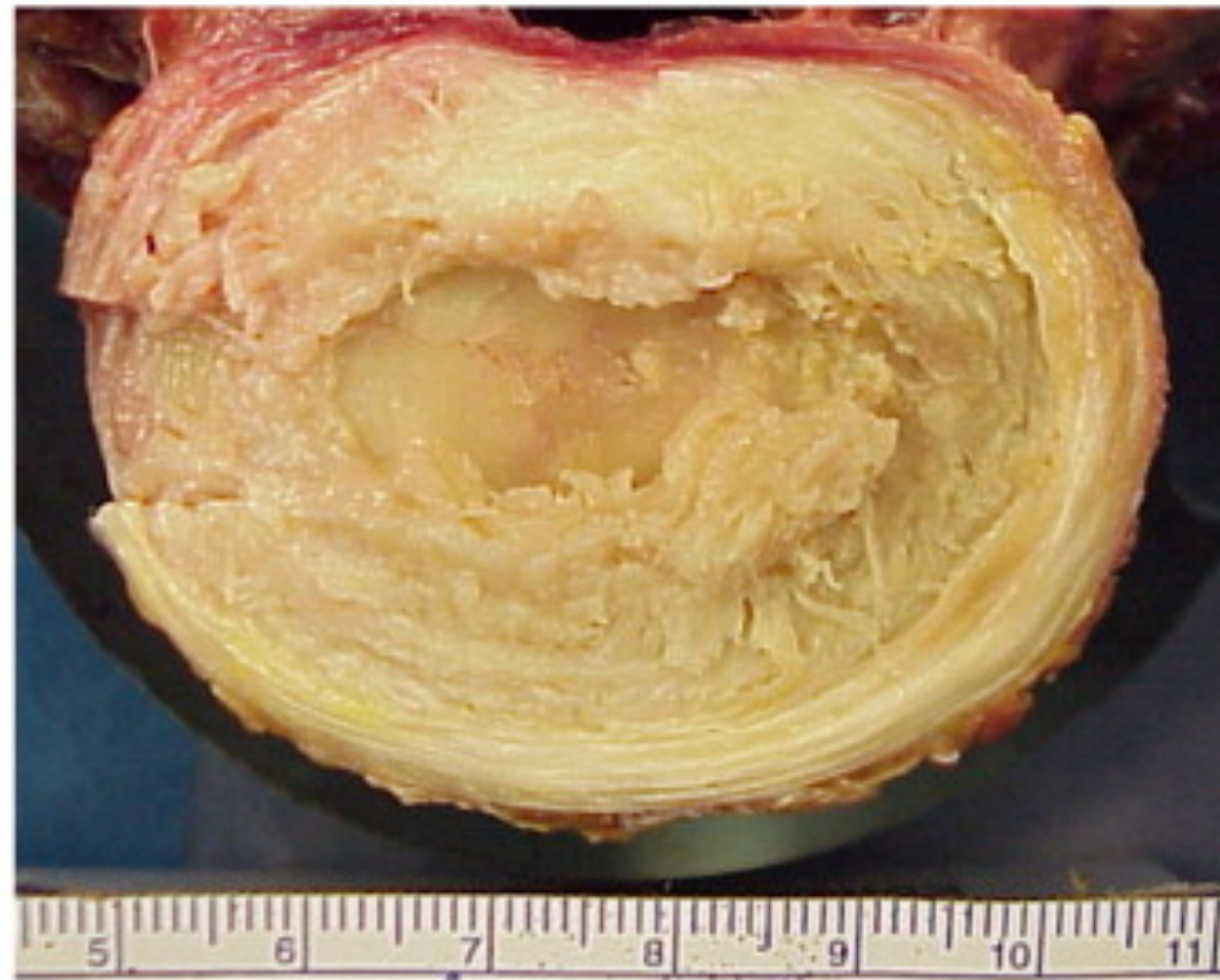


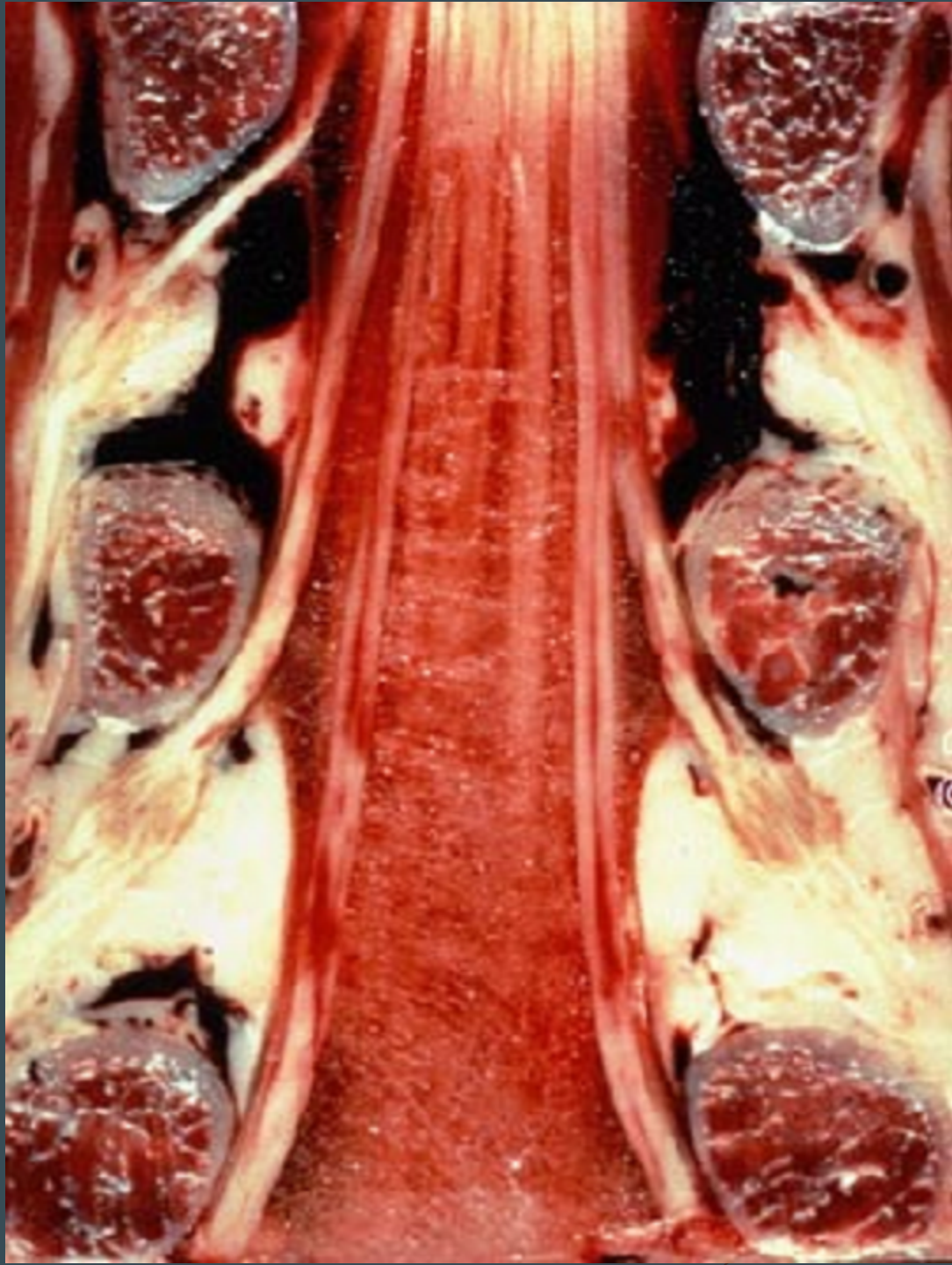


A



B







Causation Analysis

- ▶ Bradford-Hill Criteria
- ▶ Parallel factors
- ▶ Causality Exam
- ▶ Occupational vs. Individual risk factors
- ▶ *Cases*

Causality Exam - History

- ▶ History from the patient - self reported
- ▶ Employment factors
- ▶ Details of alleged exposure
- ▶ Equipment involved, duration of exposure to risk factors, equipment malfunction
- ▶ Recent workplace changes (supervisors, hours, quotas, staffing)

Causality Exam - History

- ▶ Recent performance review
- ▶ If repetitive trauma - what happens when away from work?

Causality Exam - Past Medical History

- ▶ Prior work accidents, MVA's, personal injuries
- ▶ Prior surgeries and outcomes
- ▶ Prior treatment for the same symptoms or injury
- ▶ Medications

Causality Exam - *Social History*

- ▶ Alcohol and smoking use
- ▶ If married, spousal employment? Disabled?
- ▶ Hobbies and exercise habits

Causality Exam - Biopsychosocial History

- ▶ Anxiety, depression, drug or alcohol addiction
- ▶ Job dissatisfaction
- ▶ Lack of social support
- ▶ Pain onset coincident with life events
- ▶ Unusual or extreme pain ratings

Causation Analysis

- ▶ Bradford-Hill Criteria
- ▶ Parallel factors
- ▶ Causality Exam
- ▶ Occupational vs. Individual risk factors
- ▶ *Cases*

Occupational Risk Factors

vs

Individual Risk Factors



Based on the Medical Literature

Occupational Risk Factors

- ▶ Body position
- ▶ Lifting, pushing, pulling, carrying requirements
- ▶ Forces exerted
- ▶ Frequency of movement
- ▶ Awkward postures

Individual Risk Factors

- ▶ Age
- ▶ BMI
- ▶ Gender
- ▶ Genetics
- ▶ Past Medical History
- ▶ Smoking History
- ▶ Personal Activities
- ▶ Biopsychosocial Situation

62 year old female with right CTS

- ▶ 20 year employee - office worker (keyboarding, telephone, filing; changes positions frequently)
- ▶ Complains of right hand numbness and weakness
- ▶ No history of trauma
- ▶ + Family history of CTS
- ▶ BMI 36
- ▶ + Diabetes



62 year old female with right CTS

- ▶ Meds
- ▶ Occupational hand therapy
- ▶ Splinting
- ▶ NCS + moderate right CTS
- ▶ Corticosteroid injection - temporary help



62 year old female with right CTS

Individual Risk Factors

► *Very Strong evidence*

- *Age (62) (High)
- *Weight (BMI-36) (High)
- *Female Gender (Y) (High)
- *Biopsychosocial (N) (High)
- *Genetics (Y) (High)
- *Co-morbidities (Y) (High)
(diabetes, RA, thyroid, wrist fx)

Carpal Tunnel Syndrome

Occupational

Individual

Genetics Diabetes

BMI

Gender

Age



62 year old female with right CTS

Occupational Risk Factors

▶ *Very Strong and Strong evidence*

- *Combinations

- (force/repetition, force/posture (N)

(Low)

- *Forceful work (N)

(Low)

- *Highly repetitive

(Low)

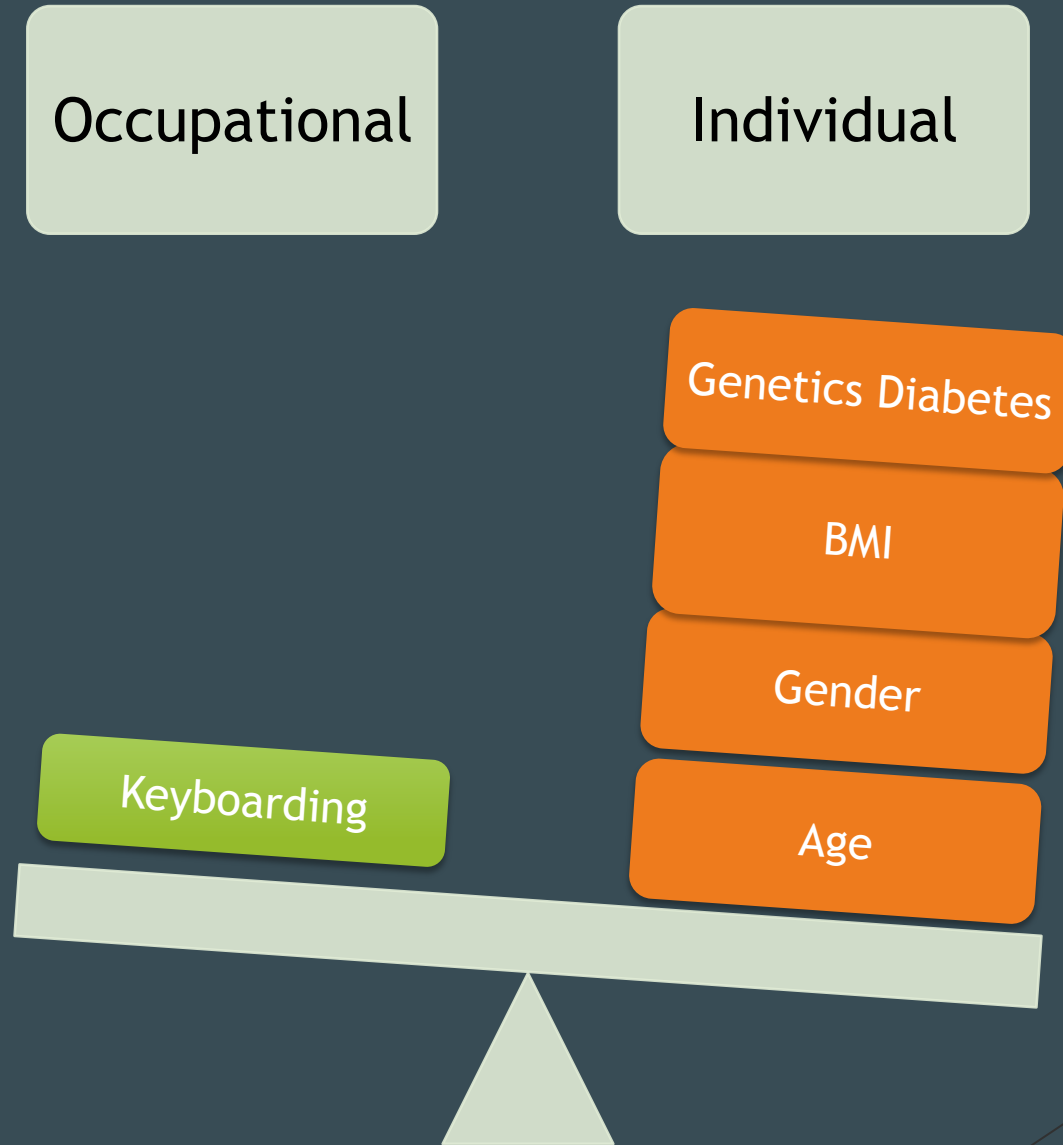
▶ *Low evidence*

- *Vibration

▶ *Insufficient evidence*

- *Keyboarding, cold

Carpal Tunnel Syndrome



Diabetes

Age

BMI

Genetics

Female

Work?

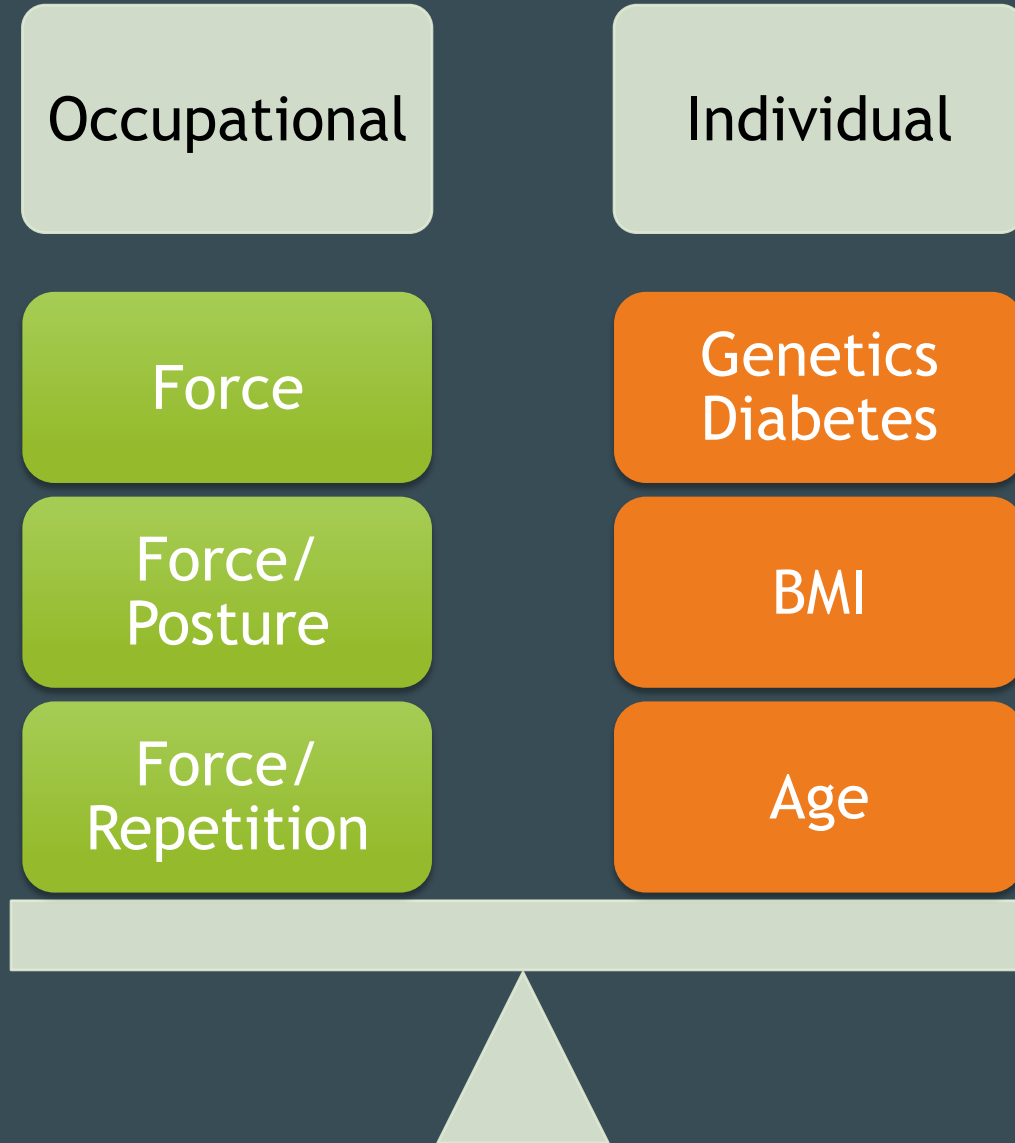


62 year old male with right CTS (Change Variables)

- ▶ 20 year employee - male carpenter
- ▶ Complains of right hand numbness and weakness
- ▶ No history of trauma
- ▶ + Family history of CTS
- ▶ BMI 36
- ▶ + Diabetes



Carpal Tunnel Syndrome



Age

BMI

Work

Diabetes

Genetics

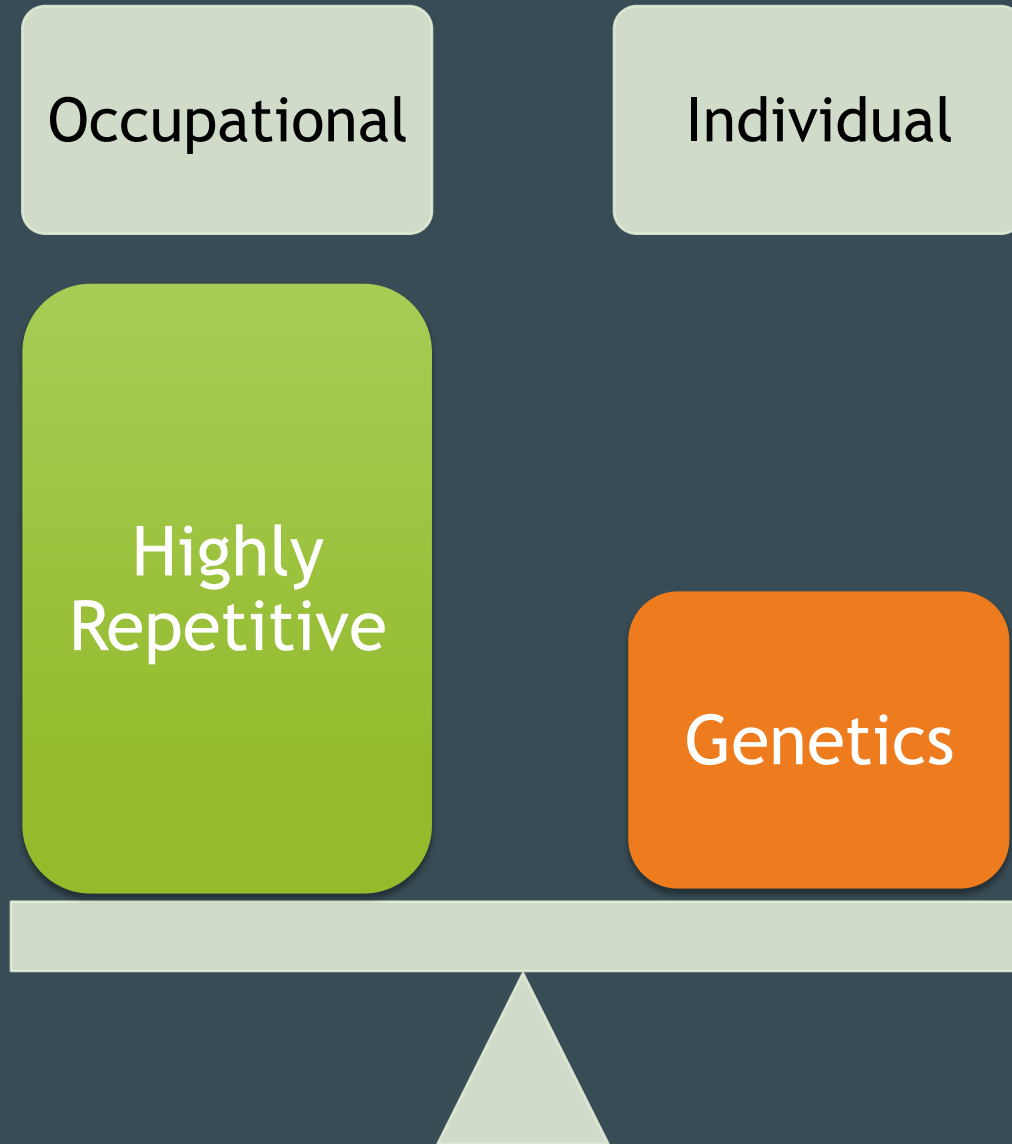


30 year old male with right CTS (Change variables)

- ▶ 2 year employee - male assembly line worker
- ▶ Complains of right hand numbness and weakness
- ▶ No history of trauma
- ▶ + Family history of CTS
- ▶ BMI 25
- ▶ No diabetes



Carpal Tunnel Syndrome



Work

Genetics



DJD - Knee

► Individual Factors

Knee DJD - Worsens with Age

Very Strong Evidence

- ▶ 8% ... 18-44 years
 - ▶ 29% 45-64 years
 - ▶ 48% > 65 years
-
- ▶ Centers for Disease Control (CDC)., 2003 *Morb Mortal Wkly Rep* 2007;56(01):4-7
 - ▶ Centers for Disease Control (CDC). 2002 *Morb Mortal Wkly Rep*. 2005;54(05)119-123.

Knee DJD - Worsens with Weight

Very Strong Evidence

- ▶ Dose Response
- ▶ Higher the weight - Higher the risk.
- ▶ Holmberg S, et al, *Intern Arch Occup Environ Health*. 2004;77(5):345-350.
- ▶ Cooper, C, et al. Occupational activity and OA of the knee. *Ann Rheum Dis*. 1994;53(2):90-93.
- ▶ Neame RI, et al. *Ann Rheum Dis*. 2004;63(9):1022-1027

Knee DJD - Worsens with trauma or surgery

Strong Evidence

- ▶ Holmberg S, et al, *Intern Arch Occup Environ Health*. 2004;77(5):345-350.
- ▶ Cooper, C, et al. Occupational activity and OA of the knee. *Ann Rheum Dis*. 1994;53(2):90-93.
- ▶ Butterworth, PA, et al, *Obes. Rev*. 2012;13(7):630-642

Knee DJD - Family History

Strong Evidence

- ▶ Twin studies demonstrate greater effect from genetics than in the workplace
- ▶ Panoutsopoulou K, et al, *Ann Rheum Dis*. 2011; 70(5):864-867
- ▶ Hanneke JM, et al, *Arthritis Rheum*. 2010;62(2):499-510

34 year old female with left knee pain

- ▶ 10 year employee - meter reader
- ▶ Complains of left knee pain
- ▶ No history of trauma
- ▶ No family history of knee arthritis
- ▶ BMI 33
- ▶ + history of left medial meniscal tear in high school requiring arthroscopic surgery

34 year old female with left knee pain

- ▶ Meds
- ▶ Therapy. She does not like to exercise
- ▶ X-rays: Medial compartment DJD
- ▶ Three corticosteroid injections - no help



34 year old female with left knee pain

Individual Risk Factors (DJD)

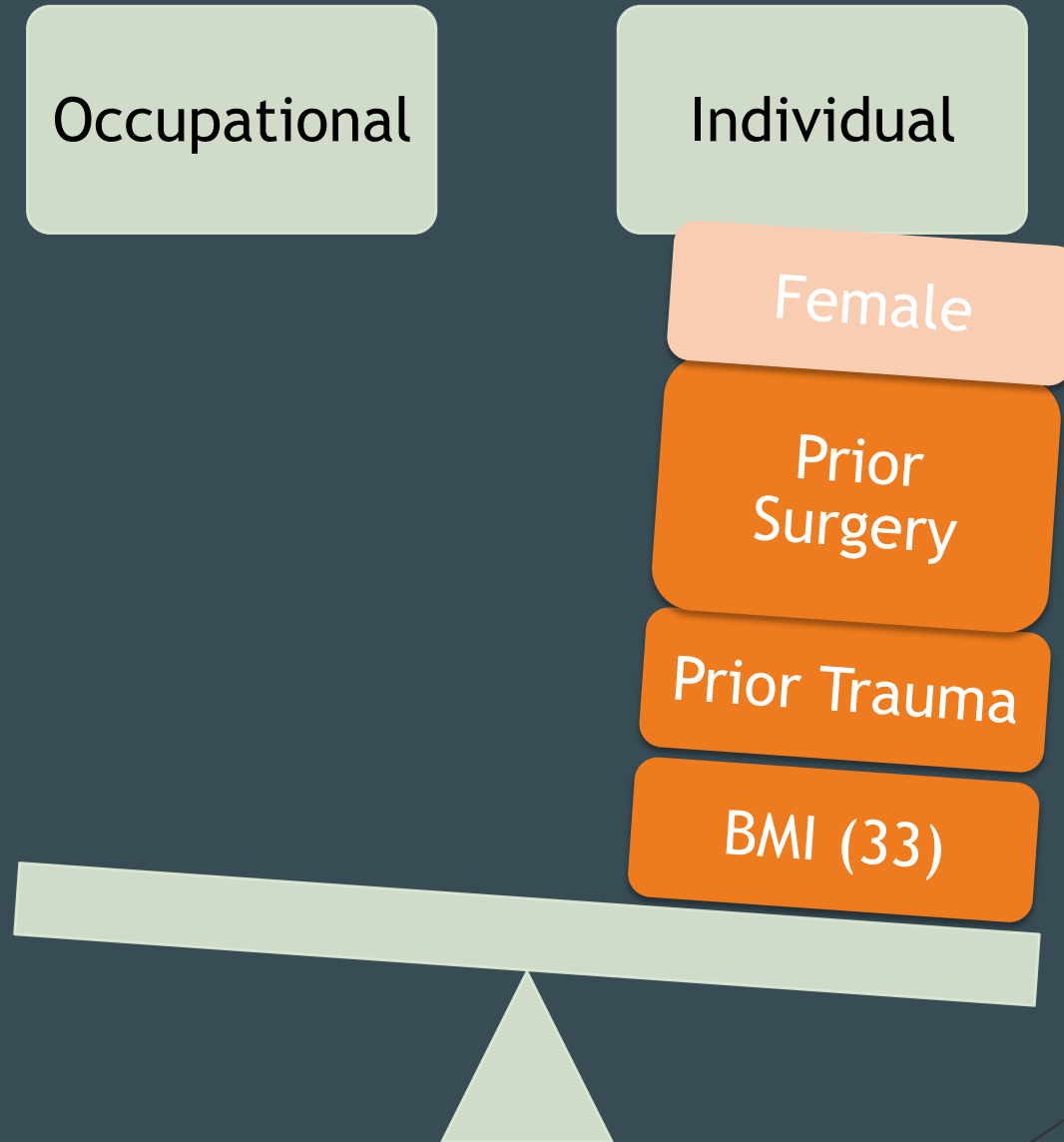
► *Very Strong or Strong evidence*

*Age (34)	(Low)
*Weight (BMI-33)	(High)
*Prior Trauma (Y)	(High)
*Prior Surgery (Y)	(High)
*Family History (N)	(Low)

► *Some Evidence*

*Female Gender (Y)	(High)
--------------------	--------

Knee DJD



34 year old female with left knee pain

Occupational Risk Factors (DJD)

► *Some evidence*

- *Kneeling (N) (Low)
- *Squatting and Knee bending (N) (Low)
- *Combinations (N) (Low)
(Kneeling, squatting, heavy lifting)

► *Insufficient evidence*

- *Standing and walking (Y)

Knee DJD

Occupational

Individual

Female

Prior
Surgery

Prior Trauma

BMI (33)

?



Knee DJD

Female

BMI

Prior Surgery

Prior Trauma



34 year old female with left knee pain (Variable)

- ▶ 10 year employee - meter reader
- ▶ Complains of left knee pain
- ▶ Stepped in a hole and twisted her knee
- ▶ + Recurrent medial meniscal tear requiring surgery
- ▶ No family history of knee arthritis
- ▶ BMI 33
- ▶ + history of left medial meniscal tear in high school requiring arthroscopic surgery

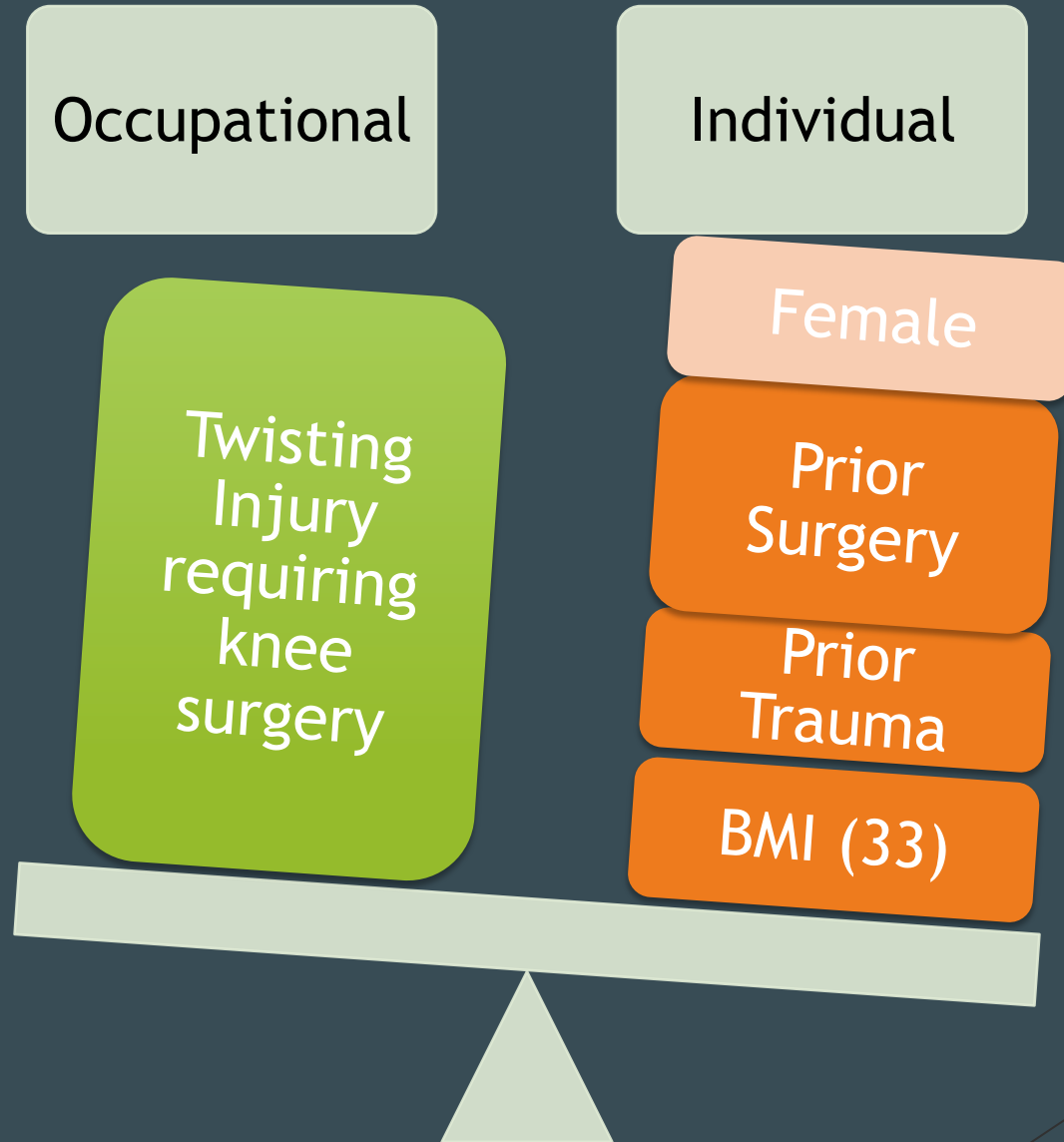
34 year old female with left knee pain

Occupational Risk Factors (meniscal tear)

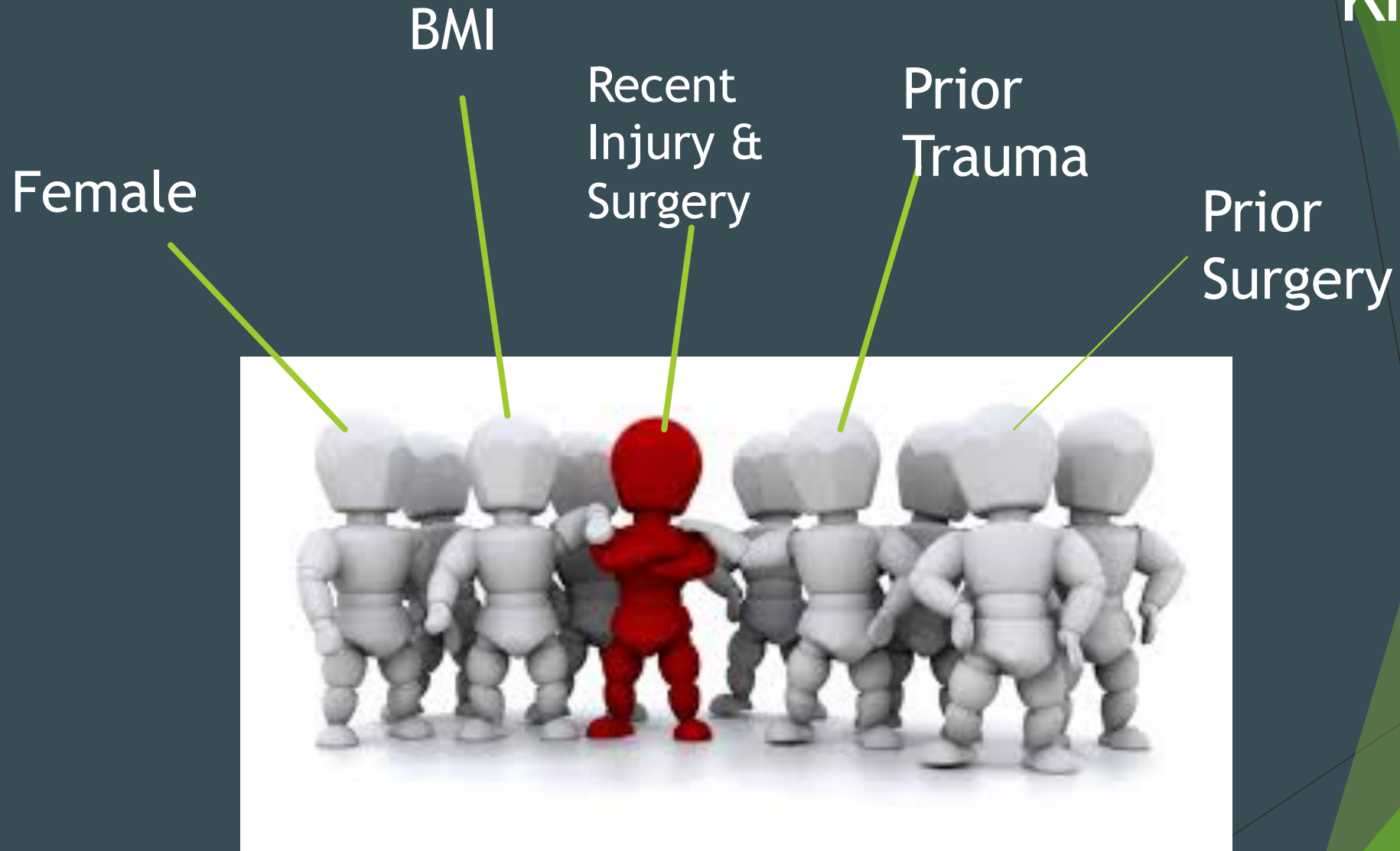
► *Some evidence*

- | | |
|---|--------|
| *Kneeling (Y) | (High) |
| *Squatting and Knee bending (Y) | (High) |
| *Combinations (Y)
(Kneeling, squatting, heavy lifting) | (High) |

Knee DJD



Knee DJD



To Determine Causation

- ▶ Clear and concise history (Duration, Time, Dose, Strength of Association)
- ▶ Is the patient reliable?
- ▶ Confirm with medical records
- ▶ Parallel Issues
- ▶ Dig deep - Personal and Occupational history
- ▶ Apply conclusions from the medical literature



Thank You!

- ▶ Questions?
- ▶ Ted.Lennard@coxhealth.com
- ▶ 417-882-3258
- ▶ 3801 S. National Ave., Jared Neuroscience Tower, Suite 900, Springfield, MO 65804



Low back pain

- ▶ Imaging studies consistent with lumbar degenerative changes are almost universal in adults.
- ▶ Anderson, GB. Epidemiologic features of chronic low back pain. *Lancet*. 1999;354(9178): 581-585

Low back pain

- ▶ Heavy physical loading is often associated with accelerated degenerative disc disease (DDD.)
- ▶ Recent studies with twins has demonstrated a *primary genetic component* with degenerative disc disease (DDD.)
- ▶ Battie' MC, Videman T. Lumbar disc degeneration: epidemiology and genetics. *J Bone Joint Surg Am.* 2006;88(Suppl 2):3-9.

Low back pain

- ▶ In general, pathology on MRI has shown little relationship to symptoms or disability
- ▶ McNee P, et al, Predictors of long term pain and disability in patients with low back pain investigated by magnetic resonance imaging: A longitudinal study. *BMC Musculoskel Dis.* 2011;12:234

40 year old male with low back pain

- ▶ 40 year old employee - maintenance at school district
- ▶ Complains of low back pain
- ▶ He noticed pain over a few days after frequent bending and lifting 30 lb boxes. No specific accident
- ▶ BMI 32; + smoking hx
- ▶ + prior episodes of low back pain (2) Resolved with Tx.

40 year old male with low back pain

- ▶ Meds
- ▶ Therapy. He does not like to exercise
- ▶ X-rays: L4/5 DDD, facet joint hypertrophy
- ▶ MRI: L4/5 disc bulge; DDD
- ▶ Epidural steroid injections - temporary help

40 year old male with low back pain

Individual Risk Factors (Low back pain)

► *Strong evidence*

- *Age (N) (High)
- *Obesity (BMI-32) (High)
- *Sleep disturbance (N) (High)

► *Insufficient evidence*

- *Smoking (N)

Low back
pain

Occupational

Individual



Obesity

40 year old male with low back pain

Occupational Risk Factors (Low back pain)

► *Strong evidence*

- **Frequent Bending (Y)*
- **Standing and Walking*
- **Work Stress*

► *Some evidence*

- **Sitting*

► *Insufficient evidence*

- **Awkward Occupational Postures (Y)*
- **Trunk Flexion (Bending) +/- Twisting (Y)*

Low back
pain

Occupational

Individual

Frequent
Bending

BMI (33)



Low back pain

BMI

Frequent
Bending



40 year old male with low back pain

- ▶ 40 year old employee - maintenance at school district
- ▶ Complains of low back pain
- ▶ He noticed pain immediately while lifting 30 lb boxes.
- ▶ BMI 32
- ▶ No prior low back pain episodes

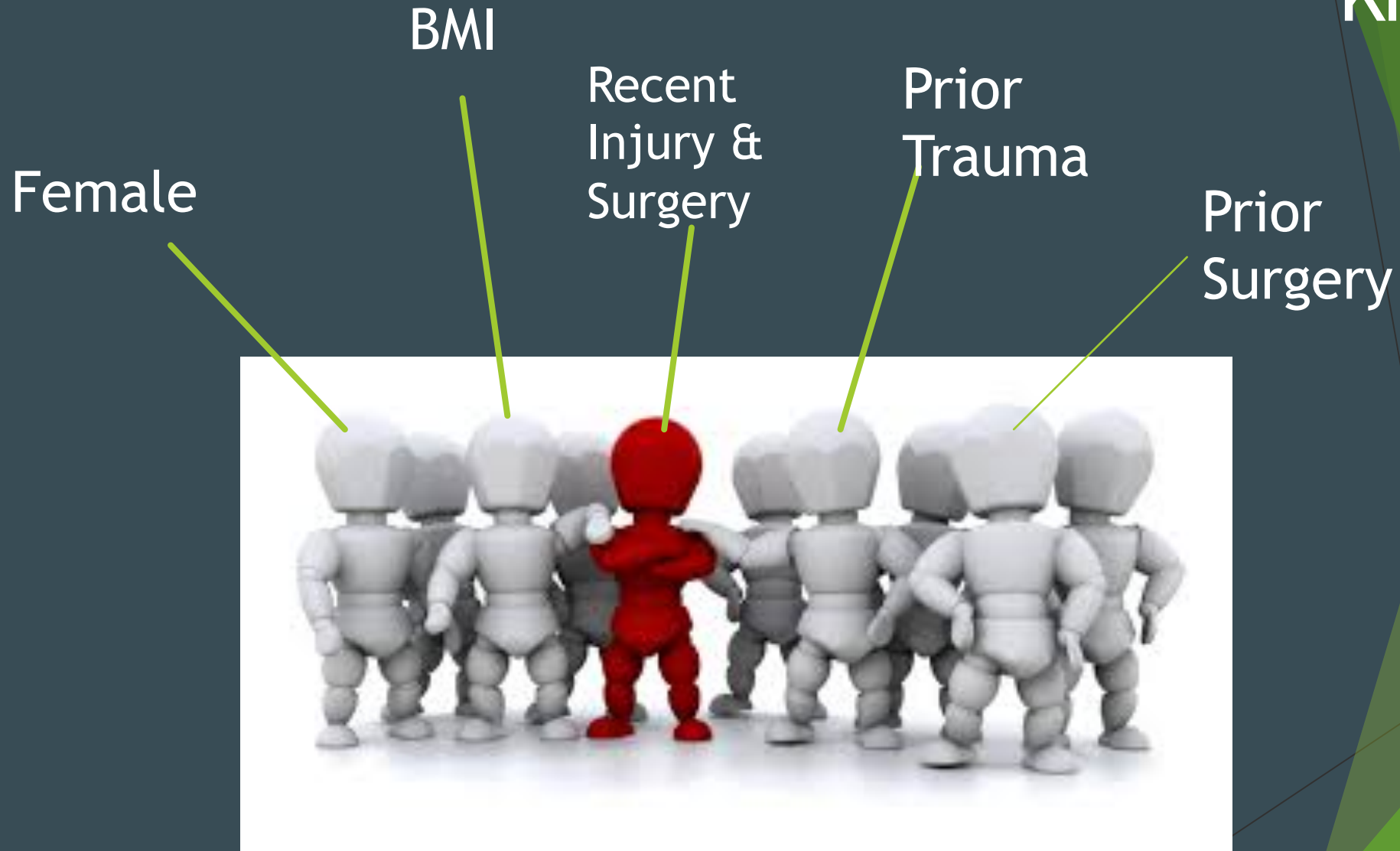
Low back pain

BMI

Work



Knee DJD



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